

Matrix Element Generators in CDF Sim ~ LesHouchesModule

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Introduction

Les Houches format (LHA format) :

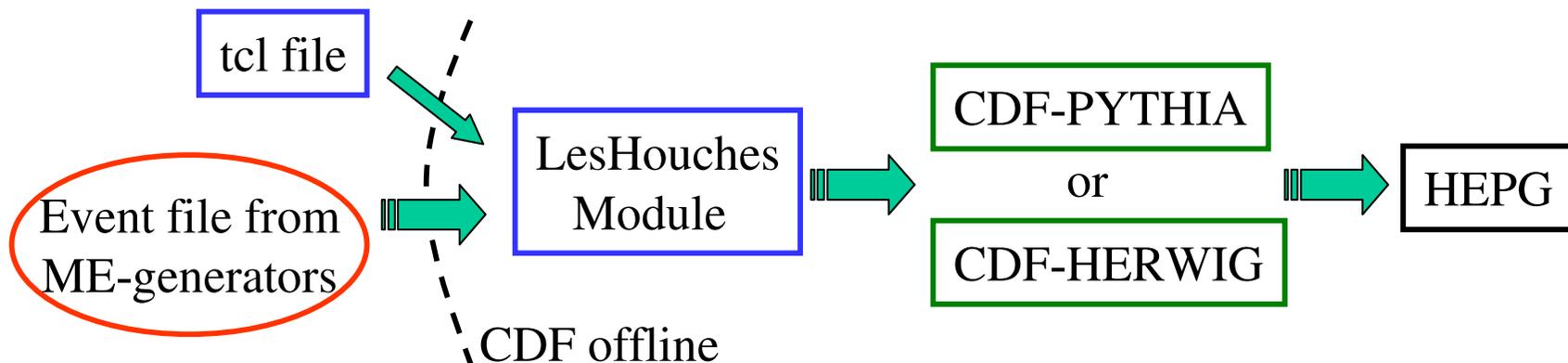
The common format for **ALL ME-generators** proposed at Les Houches conf. 2001. (hep-ph/0109068)

➡ Easily interfaced into PS-generators (**PYTHIA** or **HERWIG**) based on this format

LesHoucheModule :

That interface module for CDF offline software according to LHA format. (CDF NOTE 6333)

➡ Controlled by AC++ framework via **tcl** files.



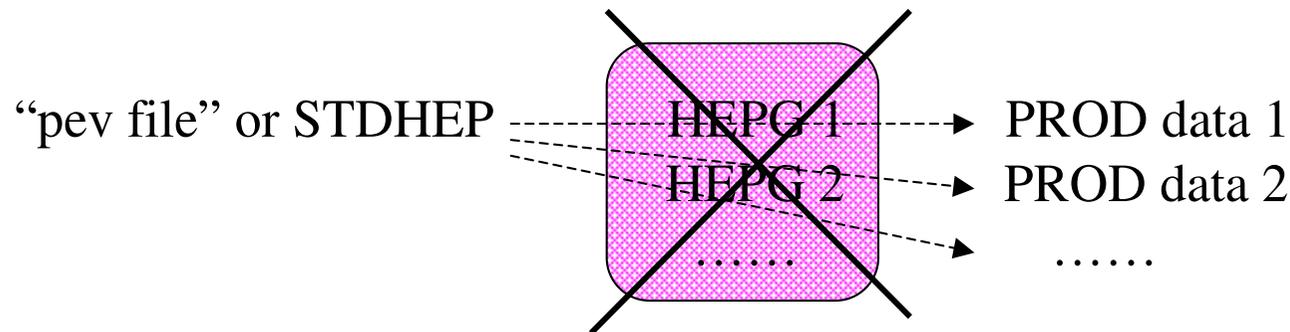
What we expect

1) Easy to use

- a) All parameters are controlled by tcl file.
- b) No trouble is expected to interface **PYTHIA/HERWIG** even Decay MC like **TAUOLA** or **QQ**.
- c) Theory-induced options.
- d) Helicity states from ME-generators are directly connected to **TAUOLA**.

2) Fast to process the production data

- a) Minimum effort to make the production data.
- b) ~Twice faster than the current procedure.
- c) Minimum data size for processing.
- d) Possible to make “multi-run number”.



Unnecessary to save HEPG file separately.

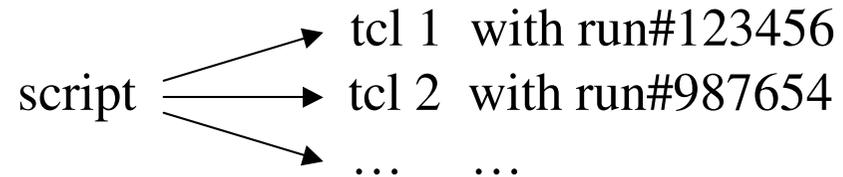
Parameters

- LesGenType** : Select ME-generators of your input event file.
AlpGen/CompHep/MadGraph/Grappa/MCFM/USER
- LesDatFile** : Name of your input event file.
- LesPSModel** : Set showering-MC of PYTHIA or HERWIG.
- firstEventToRead** : The starting event number to store in HEPG.
- putResonance** : Set resonance particles (W or Z) in the event history.
- scaleOfKtClus** : Set energy scale for the parton shower based on kt-clus algo..
- useTAUOLA** : Use or not. The helicity info. from ME is connected correctly.
- useStdHep** : Read from STDHEP files or write the STDHEP file.
- StdhepFileName** : The name of STDHEP file to read or write.
- NumOfStdEvent** : The event number to read or write in STDHEP file.
- PythiaMenu** : Menu of PYTHIA. This is exactly same as CDF-PYTHIA.
- HerwigMenu** : Menu of HERWIG. This is exactly same as CDF-HERWIG.
- (useJIMMY)** : (Use JIMMY underlying event model for HERWIG.)

CAF Production

Now, the **LesHouchesModule** is a part of **MCProd**.

Thus, a multi-run number sequence will be handled by MCProd script.



Then, throw them into **CAF jobs**.

“pev file” or STDHEP & “tcl” file 1 —————> PROD data 1 (CAF node 1)

“pev file” or STDHEP & “tcl” file 2 —————> PROD data 2 (CAF node 2)

..... —————>

 No need to save HEPG separately.
The “tcl” files contain all parameters settings.

Test was fine.  Thank you Kathy & Beate for checking it.
Detail procedure will appear in official web page.

It is ready to use in 5.3.3.

Our experience

When we develop ME-generator itself in CDF offline software, we had lots of problems.

- 1) **conflict problem** : same name of subroutine and common block variables. (ex. /**QCDDPAR**/, or /**INITPAR**/ etc.)
- 2) **executable size** : if we include the whole ME-calculation routines the executable becomes to be > 500 Mbytes.
- 3) **compile option** : depending on this options is unpreferable feature of the CDF coding policy since Run I.

Note that these are all fortran specific problems.

We can not guarantee those output results.

Then, **we realized that the ME-generators should be outside CDF offline.**

 prepare the (unweighted) event file from the ME generator, then, fed it into our CDF-offline interface.

How to include your own format

We also provide a simple & easy way to define the user original format in LesHouchesModule.

1) Check the event file format. Type,

```
~% diff [your generator]/UPINIT LesHouches/src/[your generator]_UPINIT
~% diff [your generator]/UPEVNT LesHouches/src/[your generator]_UPEVNT
```

If you see a lot of lines, your event format is not suitable in LesHouchesModule.

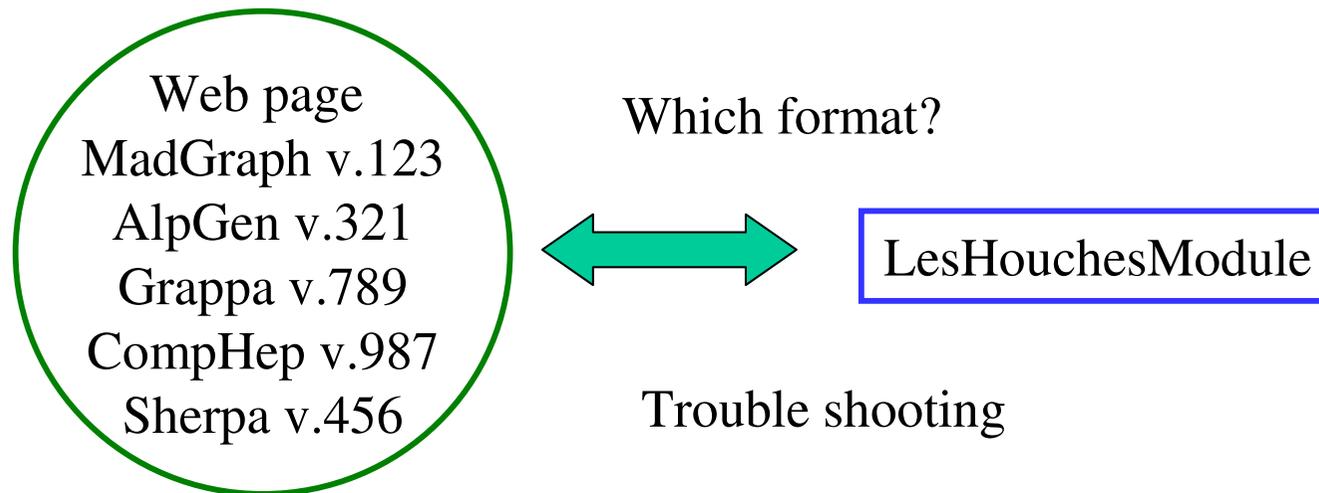
2) To use it, replace/add your new **UPINIT/UPEVNT** (and the other related subroutines) into LesHouches/src/[your generator]_les.F as the subroutine name of [your generator]_UPINIT/UPEVNT.

It should work.

More specified details is in <http://nkek15.fnal.gov/~tsuno/leshouches.html>

Documents

Although LesHouchesModule provides an easy instruction to add a different format from ME-generators, it is also useful to organize **web page** to show which version or format of ME-generators are available. Also, user's feedback is appreciated.



Summary

LesHouchesModule is the interface for CDF offline software according LHA format which is the common agreement for all ME-generators.

We expect :

- 1) Easy to handle **CDF-PS-generators** and **CDF-Decay-generators**.
We can use the quite same MCs recommended by physics group.
- 2) All parameters are controlled by tcl files.
Able to trace back which parameters are used for simulation.
- 3) Input event data file is directory passed through the detector simulation.
Need not to save HEPG separately. (more efficient)
Speed up!!
Save the disk space.
- 4) Work as a part of **MCProd (cdfSim)**.
Officially supported. (documentation on web page)
Adding multi-run number.
- 5) Simple instruction to add a new format.
- 6) Possibility to handle **SAM/PATRIOT** data storage system.

It's ready to use since 5.3.3.

Code structure

